J-Matrix Analysis of Resonant States in the Shell Model

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We suggest a method for calculating energies and widths of resonances based on analysis of dependence of eigenenergies E_λ obtained in variational calculations with oscillator basis on the oscillator basis spacing $\hbar\Omega$. Using the J-matrix formalism in scattering theory, we calculate the S-matrix at the energies E_λ and fit the parameters of the resonance governing S-matrix energy dependence in the vicinity of the resonance. The suggested approach is tested in calculations with model Woods–Saxon potentials and applied to calculations of resonances in $n\alpha$ scattering using the no-core shell model results for ^{5}He nucleus obtained with JISP16 interaction.